

SAYRE (R.H.) *al*

THE TREATMENT OF

*With the Compliments
of the Author.*

NEGLECTED CASES OF ROTARY LATERAL
CURVATURE OF THE SPINE

BY

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REGINALD H. SAYRE, M. D.



REPRINTED FROM THE NEW YORK MEDICAL JOURNAL FOR MARCH 18, 1893

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THE TREATMENT OF NEGLECTED CASES OF ROTARY LATERAL CURVATURE OF THE SPINE.*

THE correct treatment of lateral curvature consists in never allowing a case to get into the condition of those I shall describe to you this evening. After the patient has become as distorted as those whose pictures I shall show, it is impossible to remove the deformity, and your efforts will simply be directed toward making the patient as free from distress as possible, and in concealing instead of remedying the deformity.

These cases all begin in a very gradual way. One of the worst cases that I ever saw was that of a patient said by her physician to have lateral curvature at a time when the mother, so she wrote me, could not believe that anything was the matter with this child's spine; and yet, in years after, when the case came under my treatment, she was one of the most distorted cripples that I have ever seen.

When a mother brings a little child to you and asks if there is anything the matter with its spine, don't glance at it in a hurried kind of way and say, "There is nothing the matter with it; she will grow out of all that"; but strip the child to the hips and let her stand in her own natural, easy attitude, giving her time to accustom herself to her surroundings and allow her muscles to relax. In a few moments you will begin to notice a dropping of one shoulder, and that the space between the body and the arms is not the same on both sides. When first in the presence of the physician, these children very often hold themselves quite erect for a few moments; but after the first feeling of strangeness has worn off and their muscles grow a little fatigued, they will allow themselves to drop into the position which they habitually assume at home, and then, and not until then, is the slight deformity apparent.

Let the child then stand in front of you. Hold its legs between your knees, and, while its knees are straight, let it bend forward and try to touch the ground with its fingers. In this position the scapulæ fall forward and the contour of the back becomes visible (Fig. 1), and slight degrees of rotation are thus perceptible which escape observation while the child is in the upright posture, and this rotation is often more to be felt with the hand than to be observed by the eye. In a certain number of cases you will find that the starting point of a lateral curvature is a deformity of the

last lumbar and first sacral vertebræ, and that the spine cants constantly to the right or left at the lumbo-sacral junction.

At times the deformity is more apparent in front than in the back. You will notice a prominence of one hip, the flesh at times sinking in quite sharply above the iliac crest, although the deformity in the back is scarcely discernible.

Among the earliest evidences of rotation you will find the inequality which almost always exists in the distance from the umbilicus to the two nipples. This is frequently to be observed before any marked change in the back has

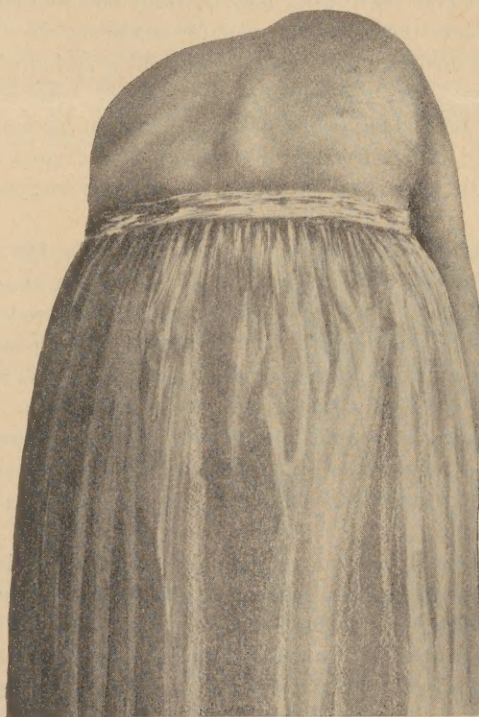


FIG. 1.

taken place. You will also usually find that the breast on the side of the convexity is smaller than that on the side of the concavity.

I have seen so many cases of bad lateral curvature, where the mothers tell me that they noticed an inequality in the two sides of the child when it was still young, but that, on consulting a physician, they were told that the child

* Read before the New York State Medical Association, November 15, 1892.

would "grow out of it," that I feel I can not too strongly impress upon you the necessity of observing these cases closely, the importance of taking measures to straighten these incipient curves, and of being sure that, if the child has a slight curve, it will not "grow out of it" as it grows older, but rather grow into it, and when she comes to puberty have so decided a change in the ribs and vertebræ that it will be impossible ever to wholly rectify the deformity.

The usual, generally received opinion that lateral curvature develops between the ages of twelve and sixteen is largely due to the fact that girls have their clothes fitted more accurately at this time, and that, in consequence, a curve that has been present for a number of years first becomes recognized—very possibly by the dressmaker—at this period; in addition to which, the increased bone growth which takes place at this age causes the deformity to progress much more rapidly in a few months than it may have done in the same number of preceding years. I believe that rickets is a much more prominent factor in the production of lateral curvature than is usually believed. We all recognize these marked cases of rickets where the bones of the entire skeleton are more or less deformed, but I feel convinced that many of the lateral curvatures are due to a primary malnutrition which expresses itself in unequal growth of the bodies of the vertebræ, instead of finding its expression in the lower extremities, as is usually the case. The fact that these girls may be stout and well nourished at the time they come to you for treatment does not invalidate this statement, as, after the active period of rickets has passed by, the subject may develop into a robust, healthy individual, simply bearing marks of his earlier disease, and it is a frequent occurrence to see stout, healthy men with aggravated bowlegs and other deformities due to rickets.

In other cases anterior poliomyelitis lays the starting point for lateral curvature. I do not mean those cases where there is a general involvement of the muscles which passes by, leaving one side paralyzed, but those milder cases in which the deeper muscles of the spine are involved, possibly to only a slight extent, and so escape our observation, while yet establishing a want of equilibrium in the muscular supports of the spine sufficient to determine a lateral curvature, and one which will be most resistant to treatment.

In some of the cases I shall describe this evening these conditions have been present, and in others the case has been consecutive to malformation of the ribs, to pleurisy with adhesions, and to other complications which we do not find in the true "idiopathic lateral curvature," so called.

As I have said before, the most effective treatment for lateral curvature consists in preventing it, as, after rotation with marked bone change has taken place, it is impossible by any system of treatment ever to restore perfect symmetry; but even in these badly distorted cases, although we can not restore symmetry, we can render the patients vastly more comfortable and, to a certain extent, reduce their deformity.*

* Some years ago I wrote more fully on the subject of prevention in the *New York Medical Journal*, November 17, 1888.

One of the greatest factors in causing rotary lateral curvature of the spine after the equilibrium between the muscles of the trunk has been destroyed—that is, after the normal curves of the spinal column have been disturbed by some adventitious circumstance—is the superincumbent weight of the head and shoulders, and no one can see many cases of lateral curvature without being forcibly struck by the difference in the contour of the body in the erect and prone positions. A patient that looks very crooked while standing will often present a fairly symmetrical appearance while lying flat upon the face.

In this spine which I now show you, which is a model devised by Dr. Judson to illustrate the action of the spinal muscles in causing rotation of the vertebræ, you will perceive that when I press the button the spine takes this double curvature, like a letter S, accompanied by rotation of the vertebræ, one upon the other (Fig. 2), and you will notice that as long as I keep my hand pressed upon this button, and so represent the weight of the head and shoulders pressing the spine more and more out of the perpendicular, my efforts to correct the curves by lateral pressure simply serve to change the long curves into a number of small ones, but that the spine is not made straight until I release the button and allow the two ends

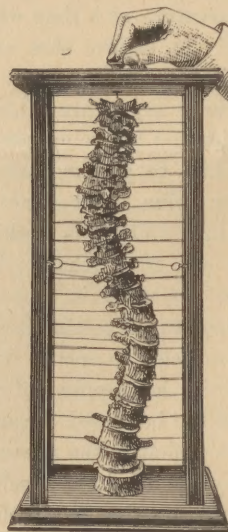


FIG. 2.

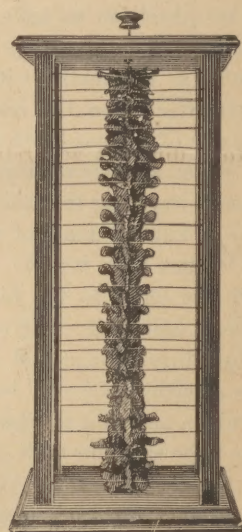


FIG. 3.

of the S to recede from each other (Fig. 3), or, in other words, take the weight of the head and shoulders off the spine and allow it to become straight. As soon as I pull on this spine I straighten it.

In putting this principle into practical execution, you will find one of the greatest helps in eliminating the curves of the lateral curvature. The amount that one of these badly distorted spines will stretch while the patient partially suspends herself by means of a head-swing and pulley is surprising to one who has not measured it with a standard, and one of the most important problems that presents itself to us in the treatment of these cases is to find a suitable means of retaining the improved position gained by this self-suspension.

In my own experience, nothing has been so satisfactory

for this purpose as a plaster-of-Paris corset, and I find that cases which have been for many years wearing nu-

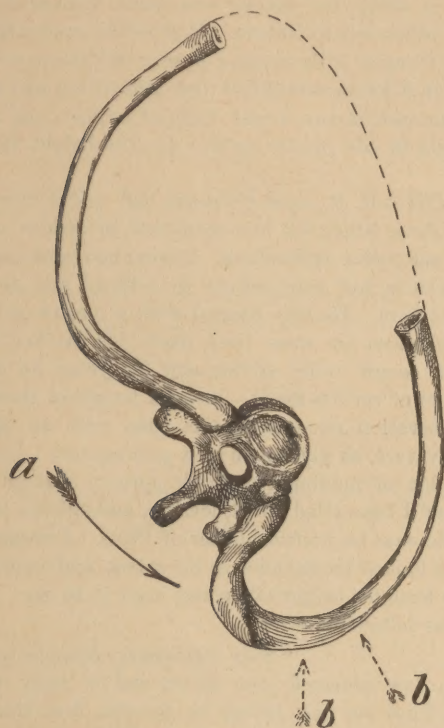


FIG. 4.—The arrow *a* shows the proper position for the application of force in reducing rotation of the vertebrae; the arrows *b b'* are the improper direction.

merous different apparatus, applied by various gentlemen of large experience, tell me that they find the corset more comfortable than steel braces; and as I find that these cases increase in health and vigor as well as in height, as shown by actual measurement, under treatment by suspension and plaster-of-Paris corsets, I am convinced of the superiority of this method of treatment over other mechanical means, which simply serve to make lateral pressure against the ribs. In order to be effective in reducing the rotation of the spine, which in these cases is the most serious element in the production of deformity, vastly exceeding in importance the lateral deviation of the spine, it is necessary that the force be transmitted to the ribs in a direction away from the spinal column and not toward it, as you will see by the accompanying diagram (Fig. 4). If the force is directed as the arrow *a* points in Fig. 4, its tendency is to twist the vertebrae toward the straight position, whereas, if it impinges against the ribs, as shown by the arrows *b b'*, it tends to curve the ribs more and more and rotate the vertebrae in the wrong direction; this second result is what practically takes place in all portable mechanical devices I have seen, aiming to push the ribs into a straight position. They do not practically carry out the principle which they are theoretically supposed to embody, and the force which is required to press these ribs into position is so great, if concentrated at a single point as in these mechanical devices,

that pressure of sufficient force to cause any practical change is more than can be endured by the skin without damage, and I therefore prefer to straighten the spine as far as is practicable by partial self-suspension and manipulation, and then to apply a plaster-of-Paris corset, while the patient is twisted as far as possible into the correct position, and thus distribute the pressure equally over the whole trunk. In this way I find that I can support the weight of the body with much greater comfort to the patient and much more efficiently than by metallic straps and pads. I have often compared this to pulling out an accordion and then preventing the accordion from collapsing by means of plaster of Paris. It has been objected to this principle that it practically does not keep the accordion from collapsing, and I have been very much interested in measuring a number of extremely bad cases of lateral curvature before treatment and after the patients were supported in the plaster-of-Paris jacket.

CASE I.—E. O., aged fourteen, whose pictures I now pass around, is a very striking example of improvement.

When first seen she was four feet eight inches and an eighth high. A plumb line dropped from the chin went outside of the right foot in front, and behind a line from the nape of the neck passed an inch to the left of the inner border of the left scapula. In front the left nipple lay to the right of the plumb line dropped from the chin. After one month's exercise she measured four feet nine inches and a quarter in her corset, a gain of an inch and an eighth in a month. In three months' time she measured without the corset four feet nine inches and a quarter, and with the corset four feet ten inches and an eighth, being an increase in height in the corset of two inches, made by suspension and kept by the corset. I here show you the first corset made for

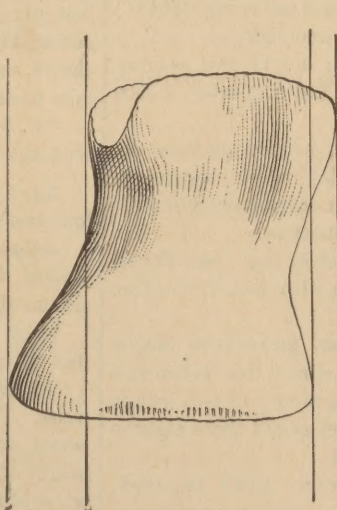


FIG. 5.

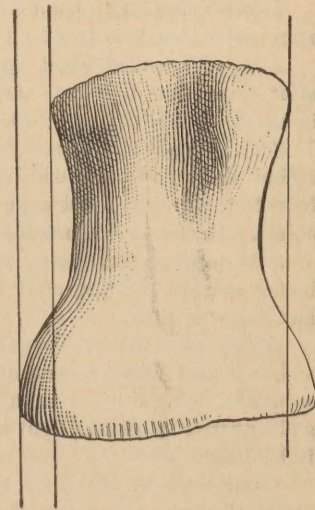


FIG. 6.

this patient (Fig. 5) and also her sixth corset (Fig. 6), which illustrate clearly the change made in her shape.

CASE II.—N. H., aged fourteen, on October 3, 1891, measured four feet six inches and three quarters; after suspension, four feet seven inches and three eighths. This gain in height from the first suspension was never entirely lost, as on the 5th of October she measured, before stretching, four feet seven inches and an eighth; after stretching, four feet seven inches and a half. On October 7th she measured, after stretching, four feet seven inches and five eighths. On October 12th in her jacket she

measured four feet seven inches and seven eighths. On October 23d a new jacket was applied, and in that she measured four feet eight inches, being a gain in less than a month of an inch and a quarter. This patient has one of the most distorted lateral curvatures I have ever seen. The deformity was congenital, and may possibly have been produced at birth, as it was a transverse presentation. When the child was six years of age she had pneumonia, followed by empyema on the right side. An incision was made between the ribs on the right side and the pus evacuated. There seems to be an absence of ribs on the right side. The lower ribs project down below the crest of the ilium, and between them and the upper ribs is a V-shaped gap, through which the liver can be distinctly felt. It is possible that instead of there being an absence of ribs on this side, they are so crowded together as to give the impression that the full number is not present. The mother thinks that these ribs were torn apart at the birth of the child.

CASE III.—C. M., aged fifteen, September 24, 1891. Height, five feet one inch and an eighth.

October 15th.—Height, five feet one inch and seven eighths. Gain in three weeks, three quarters of an inch.

CASE IV.—E. N., aged fourteen, July 7, 1891. Height, four feet eight inches.

July 30th.—Height, four feet nine inches and a half. Increase in three weeks, an inch and a half. After stretching, height, four feet ten inches and a quarter.

August 5th.—Height in a plaster-of-Paris corset, four feet ten inches and seven eighths, an increase in less than a month, while supported by his corset, of two inches and seven eighths. [This patient was shown after the reading of the paper. He measured without his corset five feet one inch. A new plaster-of-Paris corset was then put on him, and in it he measured five feet two inches and seven eighths, an increase of an inch and seven eighths.]

CASE V.—W. K., aged fifteen.

February 13, 1891.—Four feet nine inches and seven eighths; after suspension, four feet ten inches and five eighths.

14th.—Suspended night and morning; height this evening after suspension, four feet eleven inches and a quarter, a gain in one day of an inch and three eighths.

20th.—Applied plaster-of-Paris corset; patient has been exercised daily and suspended; height to-day before suspension, four feet ten inches and a quarter; after suspension and with corset, four feet eleven inches and three quarters.

24th.—Before suspension without jacket, four feet eleven inches and five eighths; after suspension with jacket, five feet and a quarter inch.

March 2d.—Before suspension without jacket, five inches and an eighth; after suspension with the corset, five inches and a quarter, being an increase in less than a month of two inches and a quarter in actual height and two inches and three eighths in his height when the corset was applied.

CASE VI.—K. M., aged thirteen years, April 19, 1892. Height before suspension, four feet four inches and three quarters; after suspension, four feet five inches and three eighths.

In October, height without corset, four feet six inches and three eighths; with corset, height four feet seven inches and a half. (See Figs. A, B, C, D, E, F, G.)

CASE VII.—R. W., aged seventeen.

September 28, 1892.—Came to me wearing a metal support, which was designed to make lateral pressure against his ribs, and which from its construction seemed to me to be more efficient in compressing than in elongating his spine. I requested his father to take the boy's height in his brace in my office, and he measured four feet eight inches; on removing his

brace, he measured four feet eight inches and five eighths. He was then suspended, and after suspension measured four feet eight inches and seven eighths. This is not the first case I have seen in which the patient was more crooked in his apparatus than when left to Nature. This patient suspended himself daily until October 10th, when a plaster-of-Paris corset was applied, and in it he measured four feet nine inches and an eighth, being an increase in two weeks' time of an inch and an eighth in his height in his plaster corset over his height in his iron brace.

CASE VIII.—H. R., aged nineteen, had spinal meningitis at the age of three which left him paralyzed in various muscles of the trunk and lower extremities. During convalescence he was allowed to sit in bed propped up by pillows, and developed a lateral curvature. He was treated with a plaster-of-Paris corset and leg braces for some time, when his mother, becoming dissatisfied, sought other advice, and for years he wore iron spinal braces of various kinds. After a length of time he came under observation once more, this time with an aggravated lateral curvature, as you see in this photograph. His muscles are incapable of holding the trunk upright without artificial support, and I have tried wood, leather, and silicate jackets on him, but he says he prefers plaster of Paris. I thought by my eye that he looked much taller in his corset, and so wrote, asking him to have his height taken and send it to me. To-day I received the following letter:

"YALE UNIVERSITY, November 14, 1892.

"—: Just received your letter, and in reply would say that when I got my new jacket on for the first time I knew from the feeling there must be a large difference in my height, for I no longer felt a *little* man, but rather that I had been drawn out by weight at bottom and pulleys at top to an enormous height; so, being anxious to know the exact fact, I measured myself accurately, and found to my great delight, as well as surprise, that with my new jacket on (also shoes) I was five feet nine inches. How's that for a stretch? Taking off my jacket, my height (with shoes) is five feet seven inches and an eighth, making a clear gain of an inch and seven eighths. I now have hopes of reaching six feet some day by a *good stretch*.

"P. S.—Since I received your letter I have measured again with the same results."

CASE IX.—L. B., twelve years old, July 18, 1889. Height, four feet one inch and three eighths.

July 27th.—Height after self-suspension and with corset applied, four feet four inches and a half, a gain of three inches and an eighth.

CASE X.—Emma D., aged twenty. March 23, 1886, four feet six inches.

March 30th.—Patient has been suspended twice daily for a week. To-day a plaster-of-Paris corset was applied. Height in corset, four feet eight inches and an eighth, an increase in height of two inches and an eighth, and decrease around the waist of four inches and a half.

September 27th.—Height, without corsets, four feet seven inches.

October 1st.—New corset applied. Height in it, four feet nine inches and an eighth, a gain of three inches and an eighth.

This patient was a most aggravated case of lateral curvature following infantile paralysis at the age of eight, which gradually passed off, leaving a few of the muscles of the trunk impaired. From the age of nine she had always worn braces of some description, and had grown steadily worse during this time.

You will notice in this case, as in all the others, that a marked increase in height takes place at the first few sus-

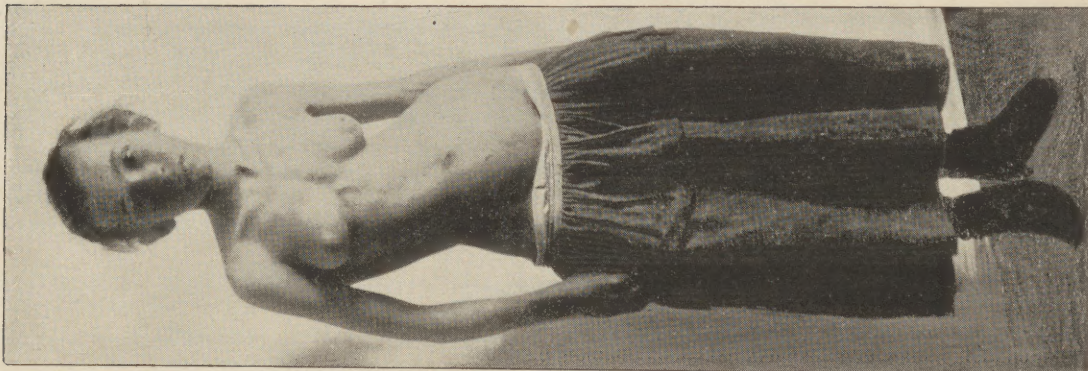


FIG. A.

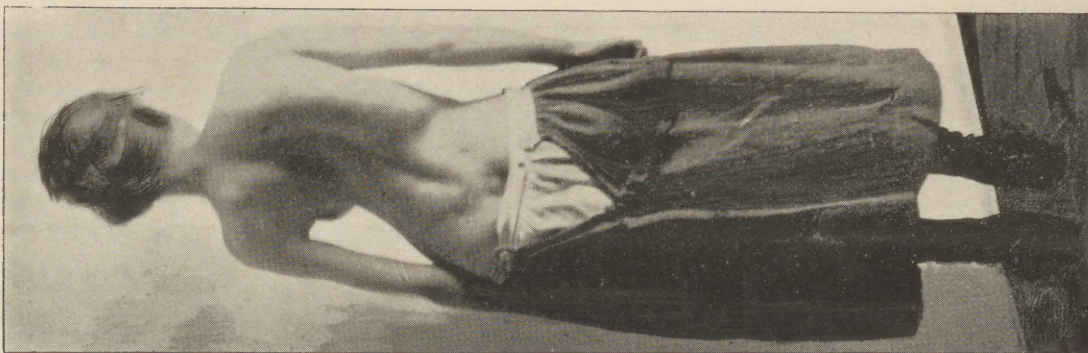


FIG. B.

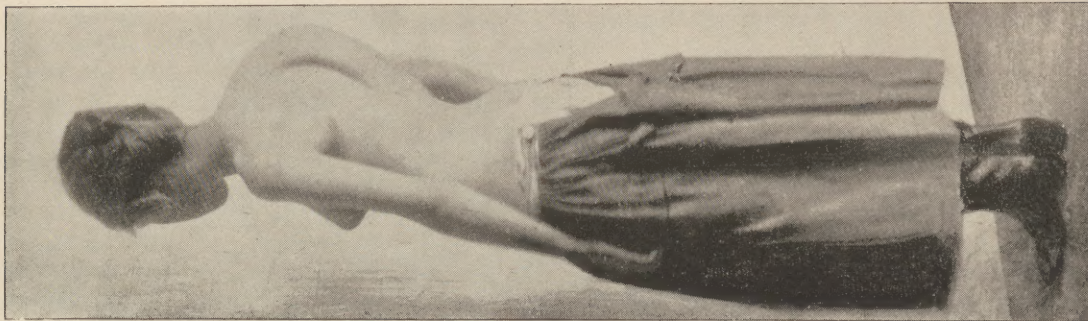


FIG. C.

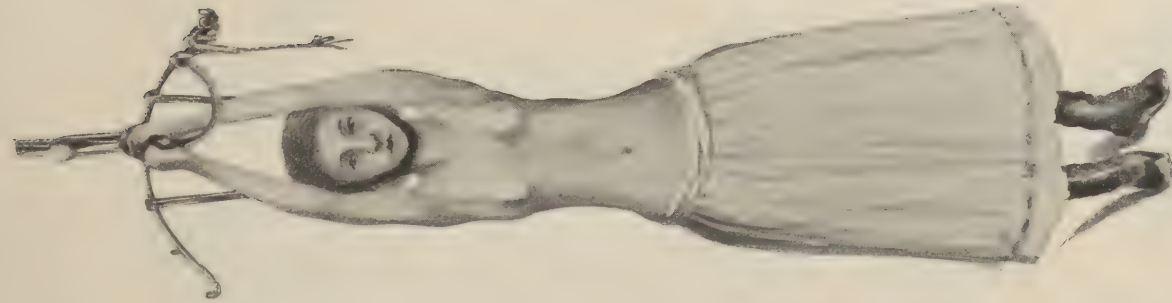


FIG. D.

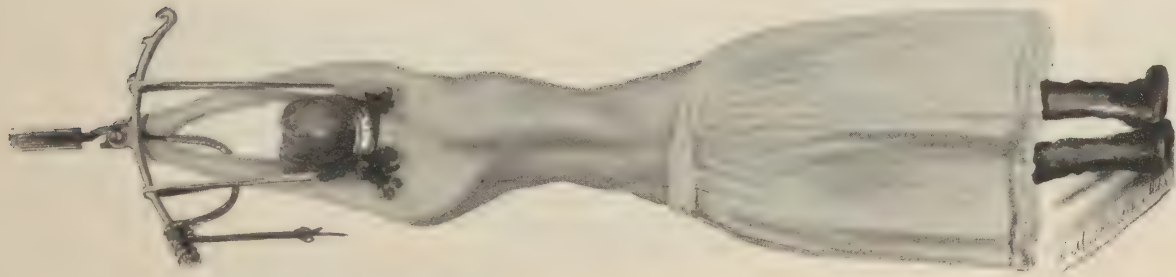


FIG. E.

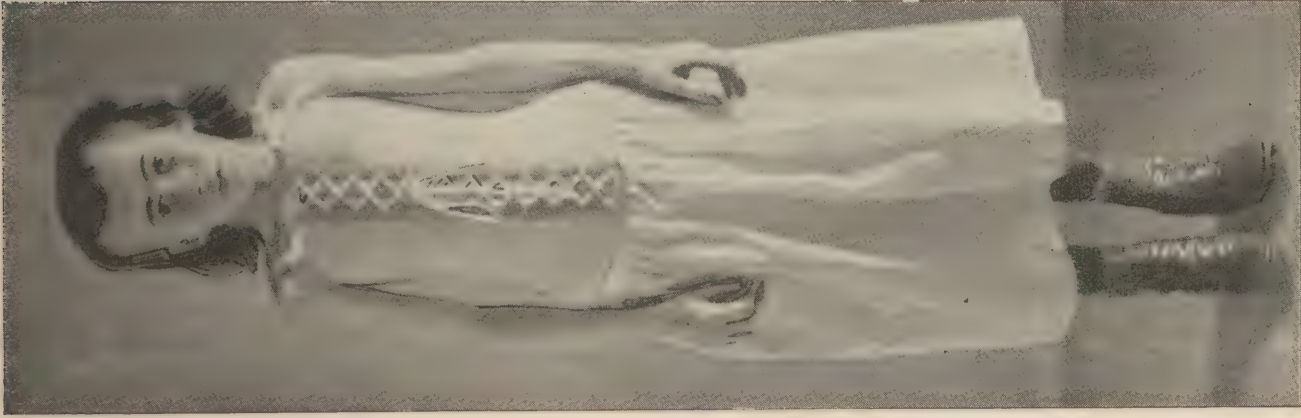


FIG. F.

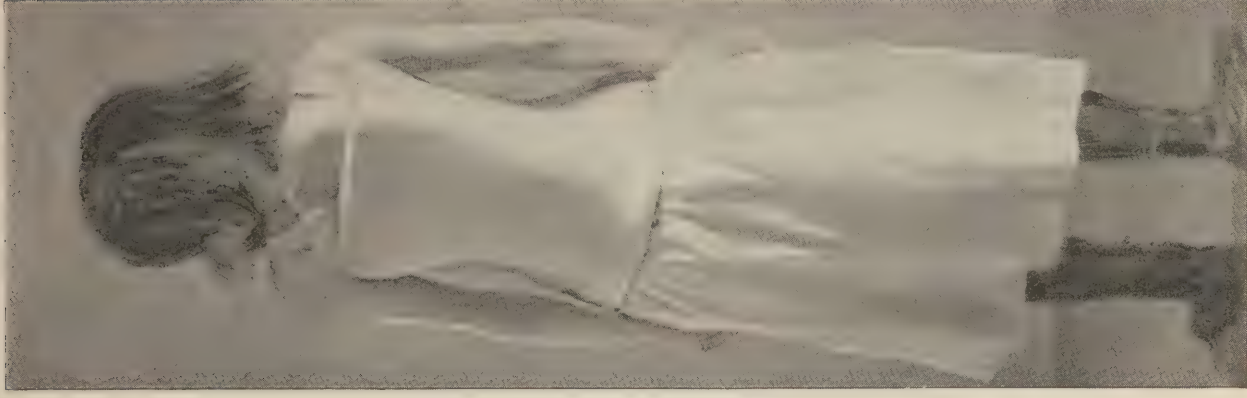


FIG. G.

Severe lateral curvature, showing effect of self-suspension and gain in height of $\frac{3}{8}$ of an inch retained by plaster-of-Paris corset.



FIG. H.



FIG. I.



FIG. K.

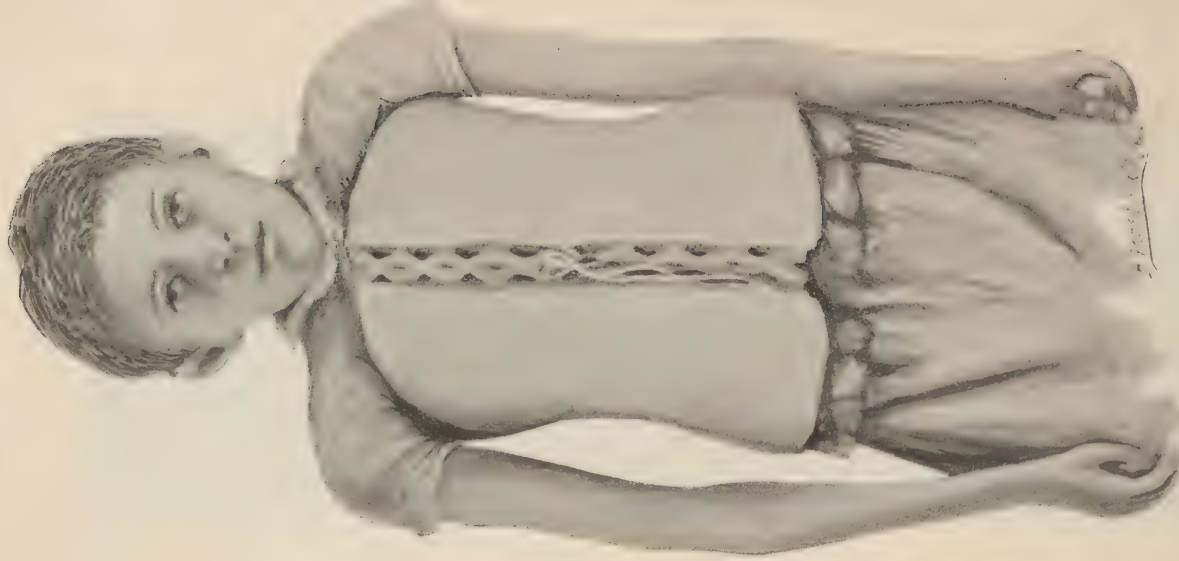


FIG. L.

Severe lateral curvature following infantile paralysis, showing gain in height of $3\frac{1}{8}$ inches from self-suspension retained by plaster-of-Paris corset.

pensions, but that after the initial gain the subsequent increase in height is only trifling. Of course, in the younger patients the increase in height which is observed after the lapse of several months is attributable, in part, to the natural growth of the body, but in a woman of twenty the latter factor does not enter into consideration, and hers is only one of a number of cases in which similar increase in height has been noticed.

I was long ago struck with the very great change made in the spines of these patients by self-suspension, but it was not until I had carefully examined the heights of a number, both before and after suspension, and with and without corsets, that I realized the enormous difference made by treatment, the increase in many instances being so great that I should have been inclined to discredit the observation had I not personally seen it.

In one case, with great distortion, in which there was a marked presystolic and systolic murmur at the apex of the heart, with great shortness of breath on exercise and pain in the right side on coughing, I noticed that while the patient was suspended in the swing the pulse beats dropped from 140 to 122, from 144 to 116, from 122 to 100, from 100 to 86 on various occasions. Every time when I noted the pulse it was from 18 to 28 beats slower while suspended than when the patient was down, and with the jacket applied, while it was not so slow as during suspension, it was, however, much less rapid than when the jacket was ~~off~~ from 6 to 20 beats slower. This I attributed to the fact that the heart was not so compressed, and was therefore in better condition to perform its functions. She noticed herself that she was much less short of breath and much better able to take exercise while supported by her corset.

I have noticed a similar slowing of the pulse in other cases, but never to so marked an extent, and I have often had patients remark the greater ease of breathing, and the relief of pain in the side while supported by their corsets.

While self-suspension, in the manner I have indicated, is a most useful means of diminishing the curvature of the spine, it is not practicable for a patient to suspend herself for a long period of time, and in many cases I am accustomed to add to self-suspension suspension by means of a weight and pulley attached to a chin piece which is fastened to the patient's head while she lies on her back on an inclined plane which is slightly convex.

The father of one of my patients has devised a most beautifully constructed folding couch to be used for this purpose, which I show here. It is capable of being taken apart and carried in a trunk so that this means of treatment can be employed during the summer while the patient is at various watering places without the necessity of transporting bulky apparatus.

In correcting the rotation, which, as I have before remarked, is a vastly more prominent element in the production of deformity than the lateral deviation of the spine, I find great benefit from having the patient lie upon the face upon the floor or a firm table covered with a thick rug, while I make strong pressure upon the projecting scapula, pushing in a direction forward and away from the central line of the body so as to rotate the vertebræ toward the

median line (Fig. 4, *a*). In some cases I allow the patient to lie for half an hour in this position with a shot-bag of twenty or thirty pounds' weight resting upon the shoulder, if it can be placed so that the weight falls in the proper direction.

To correct rotation, Dr. Beely, of Berlin, has devised a frame in which the patient leans forward, with the elbows resting upon a couch, while the back is parallel with the floor—very much in the position of a boy playing leap-frog—while a strap passes across the back, sustaining a heavy weight at its end. The objection to it is that the weight, instead of twisting the spine around in the proper direction, acts to compress the ribs laterally, which objection Schede, of Hamburg, has recently tried to overcome, in an apparatus of his devising, by attaching the weight to broad bands of adhesive plaster, which are secured to the walls of the chest. By these he endeavors to twist the spine around a perpendicular axis, while the hips and shoulders are held immovably fixed by means of iron props extending from a circular frame which passes around the patient, who is also stretched by a pulley-wheel and head-swing.

I have had no personal experience with Schede's apparatus nor with that of Bradford, of Boston, which is designed to accomplish very much the same purpose, but have been able to perform the twisting of the spine by means of my hands. In Bradford's apparatus the patient is partially suspended by the hands and arms, the pelvis being firmly fixed on a chair by means of a large screw, while pressure is made against the chest walls at different points by means of padded screws, which pass from a circular band of iron which encircles the thorax at some distance from it, and is firmly fastened to two uprights passing from the chair.

In correcting the rotation of the spine, any apparatus of this sort must pass to the floor for a base of support, and all the machines which have been designed to rotate the upper part of the thorax, while the machine takes its point of origin from the pelvis or thighs, are futile, and are lacking in the mechanical power to perform the work they are called upon to do. All that any machine fastened to the body can do is to retain the improved position which is gained by manipulation or force applied from some fixed point outside the body, and to retain this improved position I am fully convinced that apparatus in the form of a corset which completely encircles the body is preferable to those appliances which make pressure merely at certain points.

The material of which this corset is to be made is not of such vital importance, provided it is light and strong and not impervious to the air. I personally prefer the plaster-of-Paris corset, as being perfectly efficient and vastly easier of construction than anything else. The wood corset of Waltuch, if properly made, is equally as firm as the plaster jacket and a little lighter, but, as usually constructed, does not retain its shape, but warps, and when exposed to the heat of the body is very apt to separate into the component layers of which it is made. The leather jackets, in my experience, are also apt to curl up along the edges, and in summer time frequently acquire a disagreeable odor; the same is true of rawhide. The sili-

cate-of-soda jackets are lighter than the plaster of Paris, but have the objection that they retain the perspiration on the body and act more or less as a poultice. The wire corset is very much cooler than anything else, and in certain cases is probably more comfortable as a retentive appliance than anything else, but in some cases does not retain the increase in height so well as a more solid material. In one of the cases I report this evening, who is now wearing a wire corset, the height is seven eighths of an inch less than while she wore one of plaster of Paris.

The great objection, however, which I would urge against all these forms of appliance is the difficulty with which they are constructed. A plaster-of-Paris corset has, first of all, to be made in which a cast is made, and over the latter the leather, felt, wood, paper, celluloid, water-glass, or wire corset is constructed, which requires either the services of an instrument-maker or the expenditure of a great deal of time by the physician himself, and to those who are not living in the large business centers all of these appliances are much more difficult to manufacture than the ordinary plaster-of-Paris corset. In cases of marked distortion, and with small children, these second casts are not so accurate in their fit as those made directly on the body. Properly made, the latter, for a girl of sixteen, should weigh from two pounds and a half to two pounds and three quarters, or, if very heavy, three pounds, and yet I have frequently seen plaster corsets which weigh from ten to twelve pounds. If the best dental plaster is used and well rubbed by hand into the meshes of crinoline from which the sizing has been removed by washing before the bandages are made, care being taken not to roll the bandage too tightly or to put in too much plaster of Paris, a corset ought never to weigh more than four pounds for the largest person, and those who complain of want of success and produce corsets like this one that I here show you, should only blame themselves for inability to learn the proper manner of making a plaster-of-Paris corset.

You see that this one is like a section of the wall of a house. It is almost solid plaster throughout and incapable of being bent, and is not shaped to the patient's figure, and therefore slipped up and down. On the other hand, I occasionally meet with corsets which seem to consist almost wholly of crinoline, contain no plaster of Paris in the meshes, and are as useless as a handkerchief tied around the body. As a usual thing, it is the failure to use plaster of Paris properly which makes physicians resort to felt and leather.

In putting the jacket on it is important in these greatly distorted cases that the patient should be suspended some little time before the corset is made, in order to gain as good a position as possible. Just before beginning the application of the bandages the patient may come down and rest for a few moments, if the neck is tired, and then stretch up to the fullest extent possible. The physician sits behind the patient and grasps her legs tightly between his knees so as to steady the pelvis and applies the bandages, beginning at the waist, passing from left to right in the ordinary cases of lateral curvature in which the right shoulder is prominent, as putting the bandages around the

body in this direction tends to remove the rotation. It is often desirable to have an assistant push the prominent shoulder forward and hold it in this position, untwisting the rotation, as it were, while the jacket is applied. It is always best to have an assistant in front of the patient to keep the bandages smooth as they are applied and rub the layers together very thoroughly. The bandages should be put, one at a time, in water of about blood heat, end up, the length of time required to put on one bandage being about the proper time during which the next one should soak. The hips should be padded outside the shirt before applying the bandages, and for this purpose I use piano felt, made by Alfred Dolge & Son, 120 East Thirteenth Street, which costs \$1.50 a pound; that which I buy is too thick to be used for padding unless split in two.

The knitted shirts which are put on next to the skin, on which the best jackets are made, are knitted for me by the Lawson Company, No. 783 Broadway, and come down to the knees, the end of the shirt being reversed after the jacket has been trimmed out and stitched along the upper edge, completely covering in the plaster of Paris. The ordinary jersey-fitting underwear can be used for this purpose in case of necessity. Between the jacket and the skin I slide a thin piece of tin, two inches wide and twenty-four inches long, covered with adhesive plaster with the sticky side toward the tin, or a piece of kid, as I can cut the jackets down much easier and quicker with this protection, and it also adds greatly to the patient's feeling of security. In growing girls and adult females it is necessary to put pads over the breasts; except in the case of very thin people or little children, the dinner pad is usually not necessary. It takes from twelve to fifteen minutes to complete a plaster jacket. As soon as the jacket is made, it is cut down the center, in front, on the piece of tin which passes down the median line of the body, and removed. A thin slice is taken off each edge in almost all cases, more being removed at the waist than elsewhere, as, except in very thin persons, it is impossible to draw the bandages quite tight enough in the waist without making wrinkles, and the addition of the kid which covers the edge of the jacket also makes it a little too large unless this slice is removed. The edges of the jacket are then brought together and retained in position by an ordinary roller bandage. If the weather is very damp, the jacket may be laid near the fire to dry; in ordinary weather this is not necessary.

The next day the patient suspends herself again, and the corset is put on and fastened with a roller bandage. It is then trimmed out under the arms and over the front of the thighs until the patient can move her arms and legs with comfort. The corset is then removed. After the corset has been trimmed out, the end of the shirt is reversed over the plaster of Paris and stitched to itself along the free border of the corset. The front edges are bound with kid pasted over the stitching, and a piece of leather containing hooks, such as are used upon shoes, is sewed with an awl and waxed thread along each edge of the corset, the stitching passing through and through the plaster of Paris (Fig. 7). Additional strength is given to the jacket if this leather is wide enough to cover a thin strip of

corset steel, half an inch wide and as long as the corset, which is placed under it. In exceptional cases of great deformity it is sometimes necessary to fasten a strip of thin steel on the outside of the corset at the point where most strain is thrown to prevent the corset from breaking. If the patient is very badly deformed, it is expedient to put padding inside of the shirt when it is reversed, in order to make the jacket as symmetrical as possible, and thus avoid the necessity of padding the clothes.



FIG. 7.

The corset having been made while the patient is stretched out, it should always be applied to him in this position. For this purpose there should be a pulley-wheel and head-swing at home by which the patients can suspend themselves in the morning. The tripod is only useful for traveling. At home a hook should be screwed into a beam to support the pulley-wheel. While thus suspended, the corset is applied to the patient by some member of the family, and retained in position by lacings joining the hooks on the front of the jacket. The lacing should pass around the two central hooks at the waist first, and then run down to the bottom, be reversed, and passed up again to the top. Applied in this manner, the corset fits better than if the lacing is begun at either end. It is a mistake to cut the corsets down in two places, as I have frequently seen done, and the corset should not be made so stiff as to render it impossible to remove it unless it is cut in two places.

I show you here two little plaster-of-Paris jackets which have been made over a tumbler; the tumbler then being removed, the open end of the box has been covered with more plaster-of-Paris bandages. In the end of each box is a hole which admits the stem of a tobacco pipe. One of these boxes is varnished and the other has been left plain, as all plaster-of-Paris jackets should be.

You will notice that when I blow smoke through the pipe into the unvarnished box, the smoke passes through the plaster of Paris on all sides, while when I blow smoke in a similar manner inside the varnished box it remains inside, showing the box is impervious to air.

I have seen in medical journals articles advising the shellacking of plaster corsets, in order to render them more durable, and wish to draw your attention to the folly of adopting this procedure, because a corset in this way becomes a poultice, as it is rendered impervious to air. In one instance, which came under my father's observation, the whole epidermis peeled off on the removal of a solid plaster jacket coated in this manner. This same objection—the impermeability to air—applies to the silicate-of-sodium and leather jackets, unless they are punched full of holes.

Some of these patients with great distortion, especially if it is dependent on paralysis, require artificial support as long as they live; but others may have their muscles developed to such an extent that they can dispense with artificial aid.

Among the exercises I have found most useful in these

cases are the following: The patient stands on the foot of the concave side and stretches the corresponding arm as high above the head as possible, holding a slight weight in the hand. This can be repeated a number of times, varying with the patient's strength, as can also the other exercises.

Standing with the convex side toward a pulley-weight, the patient lifts the weight by pulling the rope with the hand of the concave side, which is passed in front of the body, and draws the rope across the body and upward, at the same time leaning the body toward the concave side and trying to expand the sunken side of the chest.

Standing with the feet together and the knees stiff, the patient bends forward and tries to touch the ground with the fingers, and rises again, lifting the hands before raising the trunk.

Standing with the convex side toward a padded support, like a fence, the patient bends laterally and posteriorly over this, stretching out the hollow side.

Lying on the floor, face upward, both arms by the sides, palms down, the arms are raised vertically till the backs of the hands touch the floor above the patient's head, the elbows being kept stiff. The arms are then brought back laterally to the position of starting, while the fingers just clear the floor.

There are a number of other exercises which I could dwell on if time permitted, but I will simply draw attention to these few as I have entered more fully into this subject in the paper quoted above, and wish this evening to speak especially of the means of retaining the improved position secured by treatment.

In keeping a record of cases I find that photography is a great help, and I also make use of tracings of the thorax, taken while the patient is bending forward with the arms drooped toward the floor. These tracings can be taken either with a piece of flexible lead tape or with this machine, invented by Dr. Beely, of Berlin, which consists of a number of steel rods sliding loosely upon each other, whose points conform to the outlines of the trunk when the apparatus is pressed upon the back at right angles to the long axis of the body and held perpendicular to the floor, after the manner of machines with which the latter takes the outline of your head. By means of a lever the steel rods are then locked in position, and the machine is laid upon a piece of paper placed on a thin sheet of felt; then, with a little roller, the teeth on the lower surface of the steel rods are pressed into the piece of paper, forming a line which gives the outline of the back at the level where the instrument was applied. By taking the outline of the trunk at each vertebra, in this manner, the difference in outline of the trunk at different portions and at different times can be recorded, and such tracings, taken at intervals of several months, serve as excellent reports of the progress of the case.

This method is, however, very much more tedious than photography, and I employ the latter very much more frequently.

The following method of taking an outline of the entire circumference of the thorax, according to the manner of

Dr. Mary Putnam Jacobi, is also interesting, and gives a cross-section of the body at any given point:

A piece of flexible metal tape, provided with a hinge in the center, is passed around the body at any desired point, and made to closely conform to the contour of the thorax. It is then removed by opening the hinge, laid upon a smooth table, the ends of the tape being brought into the same position they occupied when on the body, and plaster of Paris, mixed with water to the consistence of cream, is poured into the center of the tape until it is completely filled to the upper edge of the latter. When the plaster of Paris has set, the tape is removed, leaving a thin slice of plaster of Paris, which represents accurately a transverse section of the body at the point at which the tape was applied.

In these sections that I show you, which were made in this manner, the rotation of the spine is very conspicuous and the sharp angle of the ribs clearly brought out. I have marked on these sections the line corresponding to the antero-posterior and lateral diameters of the body, and the sections through the mid-dorsal region show excellently the great increase of one oblique diameter and diminution of the other, with prominence of the right scapula, while this section through the lumbar region shows the exact reverse of this condition.

These sections show very clearly the very adverse circumstances under which the heart and lungs labor in performing their functions in advanced lateral curvature, and no one can percuss or auscult one of these chests without being struck with the unusual number of abnormal sounds he meets. Disorders of digestion are also of very frequent occurrence, and many of the cases suffer from severe neuralgias, due to pressure on the intercostal nerves as they emerge from the foramina of exit between the vertebræ. This preparation shows very clearly the great compression which sometimes takes place between the ribs, and shows how the bodies of the vertebræ may be rotated around the perpendicular axis of the body—almost to a right angle (Fig. 8). You will observe that the lumbar ver-

tebræ and the cervical vertebræ in this preparation are in the same plane, while those in the dorsal region are rotated at an angle of eighty-five degrees, and the ribs are so compressed against the bodies of the vertebræ that one wonders how the lungs manage to expand at all. The rotation in this case was so sharp that during life the projection was mistaken by a number of gentlemen who examined the patient for the antero-posterior curvature of Pott's disease, the angles of the ribs being mistaken for the spinous processes of the vertebræ.

In exceptional instances, where the ribs are so twisted as to press against each other or against the crest of the ilium, it may be necessary to resect one or more ribs in order to give relief from pain in some cases, and in others to avoid caries from pressure.

While I formerly thought that many of these patients were so distorted that it was useless to attempt to treat them, I have in a number of instances yielded to their solicitations and applied plaster-of-Paris jackets and commenced a system of exercise, with so much benefit to them that I have changed my mind and concluded that I have yet to see a case of lateral curvature so bad that I think it can not be rendered more comfortable by treatment; and if we can make these miserable cripples less unsightly, can help them to conceal their deformity, or can relieve it, even in a moderate degree, the result is well worth the time and trouble spent upon them.



FIG. 8.

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